

Argyro Zenetos* & Jacobus J. Van Aartsen**

THE DEEP SEA MOLLUSCAN FAUNA OF THE S.E. AEGEAN SEA AND ITS RELATION TO THE NEIGHBOURING FAUNAS***

KEY WORDS: Deep Sea Mollusca, Rhodes isl. S.E. Aegean Sea

Summary

The malacofauna of the deep sea area N.W. of Rhodes isl. (Aegean Sea) was studied from living material as well as from shell debris. Overall 165 species were identified belonging to: Bivalvia 76, Gastropoda 79, Scaphopoda 2, Polyplacophora 7 and Cephalopoda 1. The bivalves dominated in the living material while the gastropods were numerically abundant in the death assemblages.

Ninety eight species are first records for the study area.

Of the above the following eleven: *Lyonsia arenosa*, *Mysella tumidula*, *Tellimyia semirubra*, *Alvania mamillata*, *Ceratia proxima*, *Clathromangelia febr*, *Retusa cuneata*, *Emarginula costae*, *Laona pruinosa*, *Raphitoma erronea* and *Skenea catenoides* were unknown so far in the Aegean as well as in the Levantine and can therefore be considered as new records for the Eastern Mediterranean.

Eight more species, namely: *Clathrella clathrata*, *Epitonium striatissimum*, *Eulima glabra*, *Febria zenetouae*, *Mangelia coarctata*, *Nassarius lima*, *Ondina vitrea* and *Pleurobranchia meckelii* are first records for the Aegean Sea while they are established along the coasts of Israel & Sinai.

No Lessepsian migrants were recognised among our fauna as expected. Finally, attention is given to some rare species such as *Tellimyia semirubra*, *Megaxinus unguiculinus* and *Philine pruinosa* as well as to some Eastern Mediterranean endemics such as *Febria taprurenensis*, *Febria zenetouae*, *Gibbula spratti* and *Dentalium rossati*.

Sommario

La malacofauna bentonica di un'area a N.W. dell'isola di Rodi (Mare Egeo) è stata studiata in base a esemplari viventi e a residui conchigliari. Sono state identificate 165 specie e cioè 76 Bivalvia, 79 Gastropoda, 7 Polyplacophora, 2 Scaphopoda, 1 Cephalopoda. La maggioranza del materiale vivente era costituito dai bivalvi, mentre i gasteropodi prevalevano nella tanatocenosi. 98 specie sono state reperite per la prima volta nell'area presa in esame.

Fra queste 11 non erano note per l'Egeo e il Mare di Levante e sono quindi da considerare nuovi rinvenimenti per il Mediterraneo orientale; esse sono: *Lyonsia arenosa*, *Mysella tumidula*, *Tellimyia semirubra*, *Alvania mamillata*, *Ceratia proxima*, *Clathromangelia febr*, *Retusa cuneata*, *Emarginula costae*, *Laona pruinosa*, *Raphitoma erronea* e *Skenea catenoides*.

Altre 8 specie sono da considerarsi nuove per il Mare Egeo, mentre risultano presenti lungo le coste di Israele e del Sinai. Esse sono le seguenti: *Clathrella clathrata*, *Epitonium striatissimum*, *Eulima glabra*, *Febria zenetouae*, *Mangelia coarctata*, *Nassarius lima*, *Ondina vitrea* e *Pleurobranchia meckelii*.

Non sono state trovate specie di immigrazione lessepsiana, mentre degne di nota sono alcune specie rare, quali *Tellimyia semirubra*, *Megaxinus unguiculinus* e *Philine pruinosa* come anche alcuni endemismi del Mediterraneo orientale, quali *Febria taprurenensis*, *Gibbula spratti* e *Dentalium rossati*.

* National Centre for Marine Research 166 04 - Hellenikon, Greece

** Adm. Helfrichlaan 33, NL 6952, GB Dieren, Holland

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Introduction

The south-east Aegean Sea is one of the most unexplored areas of the Mediterranean Sea. The area around the island of Rhodes is of special interest from oceanographic point of view since it is the field of interaction between the Aegean Sea and the Eastern Mediterranean Seas (POLLAK, 1951).

The eminent malacologist G.J. Jeffreys, based on earlier work by FISCHER (1877), reported a good number of mollusca found as fossils of the Pliocene and Post-Tertiary in Rhodes.

Later researches resulted in adding a number of species to those previously found and recorded by Jeffreys (ISSEL, 1929; BISACCHI, 1929; TORTONESE, 1951; PAGET, 1976; NORDSIECK, 1976). In the framework of a National Centre for Marine Research (NCMR) project, carried out in 1983-84, the molluscan populations (living and death assemblages) of the deep sea area N.W. of the island were thoroughly studied. Recently, an extensive list of the marine mollusca of Rhodes was prepared in the framework of a Hebrew University-Smithsonian Institution joint program, which however concentrated only to the shallow water species (BARASH & DANIN, 1989).

Indications exist that the hydrology of the area has an effect on the migration of species from the Eastern Mediterranean into the Aegean Sea (BERDUGO, 1968) and that the ecological character of the area has been affected by the pattern of the water movements (FURNESTIN, 1979).

The aim of this study is to give a record of the deep sea mollusca of the area around the island of Rhodes, as complete as possible, considering their distribution in the S.E. Aegean Sea so that conclusions about migration of the species can be drawn.

Material and methods

Benthic samples were collected on a seasonal basis (August, November 1983, February, May, 1984) at five stations (R1-R5) spaced out along the N.W. coast of the island of Rhodes (Fig. 1).

The station locations, depths and substrate type are given in Table 1.

Five samples were taken at each station with a Van Veen grab (HOLME & MCINTYRE, 1971). The sediment was sieved on board through a 1 mm sieve and the remaining material was stored in 4% formalin solution stained with Rose-Bengal. After sorting out of the material into the main benthic phyla the molluscan specimens collected either alive or dead were identified. The nomenclature and classification followed is that adopted by SABELLI et al, 1990.

Table 1 - Location of stations, depth and type of substratum

Station	Latitude	Longitude	Depth in m	Substrate
R1	36 27.5 N	28 17.5 E	70	coralligenous
R2	36 26.0 N	28 13.8 E	45	silty sand
R3	36 25.5 N	28 10.8 E	63	»
R4	36 25.0 N	28 6.0 E	130	»
R5	36 23.2 N	28 1.5 E	90	»

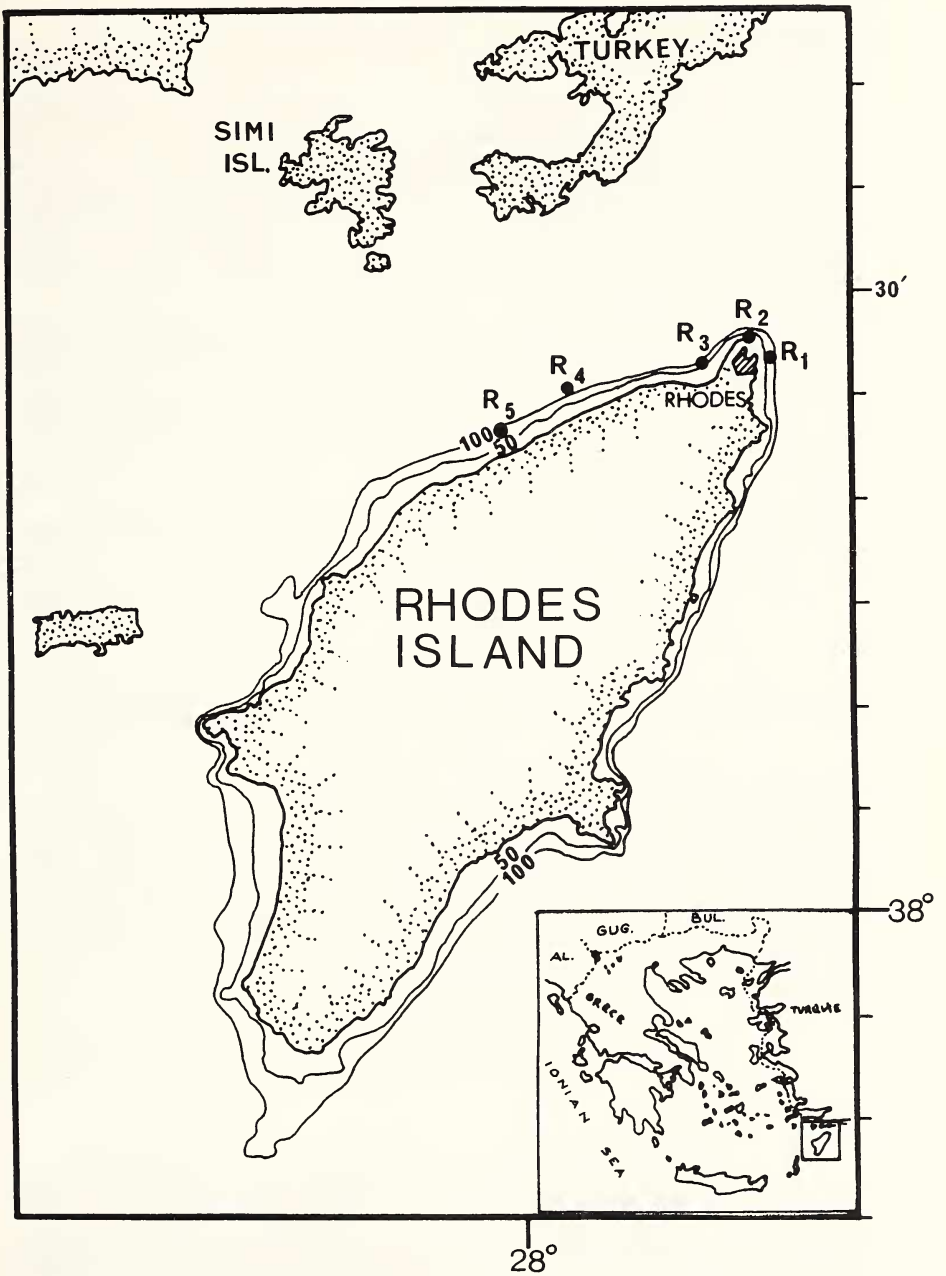


Fig. 1 - The five stations (R1-R5) spaced along the N.W. coast of Rhodes

Results discussion

Faunal - Ecological observations

Overall 165 species of Mollusca were identified, 86 of which were collected alive and 120 as dead specimens (79 dead only).

A complete list of the species in systematics order is given in Table 2. The first two columns of the table give the pooled number of individuals found either in the living material or among the detritus remaining after sorting out the samples. The symbol + denotes that the species was found in unspecified numbers.

The majority of species were represented by 2-10 individuals, a moderate number had single occurrences while thirteen species namely: *Abra longicallus*, *Aequipecten opercularis*, *Cardiomya costellata*, *Chlamys flexuosa*, *Glans aculeata*, *Nucula nitidosa*, *Nuculana commutata*, *Nuculana pella*, *Parvicardium scabrum*, *Solemya togata*, *Timoclea ovata*, *Trophon muricatus* and *Dentalium rossati*, which were met with more than 20 individuals, can be thought of as deep water common ones.

Many of the molluscan species found in Rhodes have a wide bathymetrical distribution from shallow waters to deep sea.

However, most of them are known to be deep water forms. Indeed, the following fourteen species: *Alvania cimicoides*, *Alvania testae*, *Nassarius lima*, *Microdrillia loprestiana* (*Asthenotoma loprestiana*), *Ringicula auriculata*, *Nucula sulcata*, *Bathyarca grenophia*, *Hyalopecten similis*, *Limatula subauriculata*, *Kelliella miliaris* (= *K. abyssicola*), *Thyasira flexuosa*, *Abra longicallus*, *Parvicardium minimum* and *Cardiomya costellata*, are among those prevailing in the bathyal zone of Taranto Gulf (Ionian Sea) at depths 245-620 m (Di GERONIMO & PANETTA, 1973).

The distribution of the various molluscan classes at the sampling stations is summarized in Table 3, and presented graphically in Fig. 2, while Fig. 3 exhibits the difference in the distribution between the dead and alive specimens for the two major molluscan classes. In the latter it is evident that the bivalvia dominate in the living material while the gastropods are numerically abundant in the death assemblages.

Zoogeographical remarks

The geographical distribution of the species into the neighbouring areas such as Crete (RAULIN, 1870; STURANY, 1896; JEFFREYS, 1883a; KOUTSOUBAS et al., 1992;), Aegean (DESHAYES, 1835; FORBES, 1844; TENEKIDIS, 1989; ZENETOS et al., 1991), Cyprus (DEMETROPOULOS, 1971), coasts of Israel (BARASH & DANIN, 1982, 1986, 1992) is shown on Table 2.

Of the 165 species identified, 67 species (41%) were already known mostly from records of the 19th century. The remaining 98 species - (45 bivalvia, 47 gastropods, 2 scaphopods, 3 chitons, 1 cephalopod) - according to table 2 are first records for the study area.

However, most of these have been reported to occur in the neighbouring Crete and are certainly distributed in the Aegean Sea. Exception are the following eleven species which are unknown in the Aegean as well as in the Levantine and can therefore be considered as new records for the Eastern Mediterranean: *Lyonsia arenosa*, *Mysella tumidula*, *Tellimya semirubra*, *Alvania mamillata*, *Ceratia proxima*, *Clathromangelia fehri*, *Retusa cuneata*, *Emarginula costae*, *Laona pruinosa*, *Raphitoma erronea* and *Skenea cate-noides*. Nevertheless, the species *Alvania mamillata* Risso, 1826 has only recently been recognised to differ from the well-known *Alvania cimex* (L., 1758) and so the species have been undoubtedly confused. The same is true for the *Emarginula* species *E. rosea* and *E. costae* for which it is not yet sure whether they belong to one (variable) species or to two different species. According to SABELLI et al. (1990), the two names are synonyms, but the authors would like to treat them as separate species until the question is adequately answered.

To the above must be added the species: *Clathrella clathrata*, *Epitonium striatissimum*, *Eulima glabra*, *Fehria zenetouae*, *Mangelia coarctata*, *Nassarius lima*, *Ondina vitrea* and *Pleurobranchia meckelii* which were unknown in the Aegean Sea but are established along the coasts of Israel & Sinai.

The most remarkable aspect of the malacofauna found by us is the absence of certain groups.

First of all, one would expect to find several Indo-Pacific immigrant species. From the Israeli coast, more than 90 of such species are mentioned by BARASH & DANIN (1986 & 1992). Also from Cyprus, the Turkish South Coast and even from Sicily such species are known already. It should also be noted that BARASH & DANIN (1989) mention four Indo-Pacific immigrants from their more littoral material. (None have been found in our rather rich material). A number of our species (*Abra nitida*, *Hemilepton nitidum*, *Limatula gwyni*, *Modiolula phaseolina*, *Palliolum incomparabile*, *Fehria taprurenensis*, *Fehria zenetouae*, *Granulina occulta*) are among those recently found to extend as far as the Mediterranean coasts of Israel & Sinai in accordance with VAN AARTSEN et al. (1989).

Remarkable too, is the absence of the genus *Rissoa* although eight species of this genus are already cited from the recent fauna of Rhodes by SCHWARTZ VON MOHRENSTERN (1864). The genera *Cingula*, *Setia*, and other rissoids are absent too. The genus *Alvania* is only present with five species. The same is true for Pyramidellidae, which are usually present in appreciable numbers. Of the more than 120 different species known from the Mediterranean only two of the most common ones namely *Ondina vitrea* (Brusina, 1866) and *Odostomia conoidea* (Brocchi, 1814), have been encountered. The related *Odostomia sicula* (Philippi, 1851) which is usually most common in the Eastern Mediterranean has not been found.

BIVALVES: Among the live collected bivalves *Mysella tumidula* (Jeffreys, 1866) and *Tellimya semirubra* (Gaglioni, 1992) should be especially mentioned. Although both species are known from the Mediterranean they are exceedingly rare and therefore their occurrence in the Eastern Mediterranean Basin can here be announced for the first time. *Tellimya semirubra* has been known under the name *Montacuta semirubra* Monterosato although never described. We think it better to place the species in *Tellimya* Brown, 1827. The species occurs in somewhat deeper water. Also live collected was a fully grown specimen of *Megaxinus unguiculinus* Pallary, 1904. As one of us recently reviewed the distribution of this nearly forgotten species, (VAN AARTSEN & CARROZZA, 1992), we here only mention the further confirmation of the range of this species throughout the Eastern Mediterranean Basin as suggested by the above authors. Juveniles of this species have been figured by CARROZZA (1985) under the name of *Leptaxinus incrassatus* Jeffreys, 1876. As the other recent mentioning of *Leptaxinus incrassatus* by TERRENI (1981) concerns in fact *Thyasira succisa* (Jeffreys, 1876), the occurrence of *Leptaxinus incrassatus* in the Mediterranean is not at all certain.

GASTROPODS: Several rare gastropods have been collected. The species *Fehria tapriurensis* (Pallary, 1904) and *Fehria zenetouae* VAN AARTSEN, 1988, which were also found in this material, can be considered to be endemic to the Eastern Mediterranean Basin.

This might be true for the genus *Fehria* as described by VAN AARTSEN (1988) as a whole as no *Fehria* species are known from the Western Mediterranean nor the Atlantic up to now.

Gibbula spratti (Forbes, 1844) has always been regarded as an endemic species, restricted to the Aegean Sea, apparently including Rhodes. Finally the rare *Laona pruinosa* (Clark, 1827) is worth mentioning. This species, also found in the deep waters of the Adriatic Sea (SABELLI, 1969), was recently figured by TERRENI (1981).

SCAPHOPODA: *Dentalium rossati* known until recently from the Israeli coasts has also been reported from the Aegean Sea (KOUKOURAS & KEVREKIDES, 1986). Its finding in Rhodes coupled with its absence in the West Mediterranean confirms its endemism in the Eastern Mediterranean.

TABLE 2 Zoogeographical distribution of the deep sea molluscan species found during the NCMR survey

Literature L1: DESHAYES, 1835; L2: FORBES, 1844; L3: RAULIN, 1870; L4: JEFFREYS, 1879; L5: JEFFREYS, 1881a; L6: JEFFREYS, 1881b; L7: JEFFREYS, 1883a; L8: JEFFREYS, 1883b; L9: JEFFREYS, 1884; L10: JEFFREYS, 1885; L11: STURANY, 1896; L12: BISACCHI, 1929; L13: TORTONESE, 1951; L14: PÉRÈS & PICARD, 1958; L15 : PAGET, 1976; L16: DEMETROPOULOS, 1971; L17: BARASH, 1982; L18: DIAPOULIS & BOGDANOS, 1983; L19: KOUKOURAS & KEVREKIDIS, 1986; L20: BARASH & DANIN, 1989; L21: TENEKIDES, 1989; L22: VAN AARTSEN et al, 1989; L23: BOGDANOS et al, in press; L24: STRACK, 1990; L25: KARAKASIS, 1991; L26: ZENETOS et al, 1991; L27: KOUTSOUBAS et al, 1992; L28: BARASH & DANIN, 1992; L29: VAN AARTSEN & CARROZZA, 1992).

	alive	Rhodes dead	previous	Crete	Aegean	Cyprus	Israel
POLYPLACOPHORA							
<i>Lepidopieurus</i>							
-- <i>cancellatus</i> (G.B. Sowerby II, 1840)	5	-	-	-	L24	L16	-
<i>Hanleya</i>							
-- <i>hanleyi</i> (Bean In Thorpe, 1844)	2	-	-	-	L24	-	-
<i>Ischnochiton</i>							
-- <i>rissoi</i> (Payraudeau, 1826)	6	-	L20	-	L2,L2	-	L17
<i>Callochiton</i>							
-- <i>septemvalvis euplaeae</i> (O.G. Costa, 1829)	1	-	L15,L20	-	L24	-	L28
<i>Lepidochitona</i>							
-- <i>cinerea</i> (L., 1767)	2	-	-	-	L24	-	L28
-- <i>corugata</i> (Reeve, 1848)	1	-	L20	-	L24	-	L17
<i>Acanthochitona</i>							
-- <i>fascicularis</i> (L., 1767)	1	-	L15,L20	-	L2,L24	L16	L17
GASTROPODA							
PROSOBRANCHIA							
ARCHAEOGASTROPODA							
<i>Acmaea</i>							
-- <i>virginea</i> (Müller, 1776)	1	-	L6	L27	L2,L21	L16	-
<i>Emarginula</i>							
-- <i>adriatica</i> O.G. Costa, 1829	-	1	-	L27	-	-	-
-- <i>rosea</i> Bell, 1824	2	-	L6	L7	L21	L16	-
-- <i>costae</i> Tiberi, 1855 (?)	-	2	-	-	-	-	-
<i>Scissurella</i>							
-- <i>aspera</i> Philippi, 1844	1	-	L8	L7	L21	-	L17
-- <i>costata</i> d'Orbigny, 1824	3	1	L8	L27	L2,L21	-	L28
<i>Gibbulia</i>							
-- <i>guttadauri</i> (Philippi, 1844)	-	1	-	L27	L21	-	L17
-- <i>magus</i> (L., 1758)	-	11	L8	L27	L2,L21	L16	L28
-- <i>spratti</i> (Forbes, 1844)	-	1	-	L27	L2,L21	-	-
<i>Clelandella</i>							
-- <i>miliaris</i> (Brocchi, 1814)	-	9	L8	L27	L21	L16	L28
<i>Jujubinus</i>							
-- <i>exasperatus</i> (Pennant, 1777)	-	16	L8,L20	L27	L2,L21	L16	L28
-- <i>montagui</i> (W. Wood, 1828)	-	3	L8	L27	L21	-	L28
<i>Homalopoma</i>							
-- <i>sanguineum</i> (L., 1758)	-	5	-	L27	L2,L21	L16	L28
<i>Skenea</i>							
-- <i>catenoides</i> (Monterosato, 1877)	1	-	-	-	-	-	-
CAENO GASTROPODA							
<i>Bittium</i>							
-- <i>latreillii</i> Payraudeau, 1826)	-	7	L15	-	L21	-	-
<i>Cerithidium</i>							
-- <i>submarinatum</i> ((De Rayneval & Ponzl, 1854)	-	2	L10	-	-	-	L28
<i>Turritella</i>							
-- <i>communis</i> Risso, 1826	-	2	L9,L20	L27	L2, L21	L16	L17
-- <i>turbona</i> Monterosato, 1877	-	1	L9	L27	L21,L21	-	L28
<i>Alvania</i>							
-- <i>aspera</i> (Philippi, 1844)	-	1	L20,L21	-	L21	-	L28
-- <i>climacoides</i> (Forbes, 1844)	-	1	L21	L27	L2, L21	-	-
-- <i>mamillata</i> Risso, 1826	-	2	-	-	-	-	-
-- <i>lineata</i> Risso, 1826	-	1	L15,L20	L27	-	-	L17
-- <i>testae</i> (Aradas & Magglore, 1844)	2	-	-	L27	-	-	L28
<i>Ceratia</i>							
-- <i>proxima</i> (Forbes & Hanley, 1850)	-	1	-	-	-	-	-
<i>Calyptreaea</i>							
-- <i>chinensis</i> (L., 1758)	9	+	L6	L27	L2,L21	-	-
<i>Natica</i>							
-- <i>filosa</i> Philippi, 1845	2	3	-	L7	L21	-	L17
-- <i>stercusmusccarum</i> (Gmelin, 1791)	3	2	L10,L20	L27	L2,L21	L16	L17
<i>Epitonium</i>							
-- <i>striatissimum</i> (Monterosato, 1878)	1	-	-	-	-	-	L28
<i>Eulima</i>							
-- <i>glabra</i> (Da Costa, 1778)	-	1	-	-	-	-	L17

	alive	dead	Rhodes previous	Crete	Aegean	Cyprus	Israel
NEOGASTROPODA							
<i>Muricopsis</i>							
-- <i>cristata</i> (Brocchi, 1814)		3	L12,L20	L27	L2,L21	L16	L28
<i>Ocenebrina</i>							
-- <i>aciculata</i> (Lamarck, 1822)		3		L27	L21	L16	
<i>Trophon</i>							
-- <i>muricatus</i> (Montagu, 1803)		20			L2,L21		
<i>Typhinellus</i>							
-- <i>sowerbyi</i> (Broderip, 1833)		1		L27	L21		L17
<i>Buccinulum</i>							
-- <i>comeum</i> (L., 1758)		1	L12,L20	L27	L21		L28
<i>Fusinus</i>							
-- <i>pulchellus</i> (Philippi, 1844)		6		L27	L21		L17
<i>Nassarius</i>							
-- <i>lima</i> (Dillwyn, 1817)		10					L28
<i>Mitrella</i>							
-- <i>minor</i> (Scacchi, 1836)		1		L7	L21		L28
<i>Vexillum</i>							
-- <i>sandrii</i> (Brusina, 1866)		15	L20		L2,L21		L28
<i>Volvarina</i>							
-- <i>mitrella</i> (Risso, 1826)		1		L27		L16	L28
<i>Granulina</i>							
-- <i>occulta</i> (Monterosato, 1869)		2		L27	L21		L17
<i>Clathromangelia</i>							
-- <i>fehri</i> Van Aartsen & Zenetos, 1987		3					
<i>Fehri</i>							
-- <i>tapurensis</i> (Pallary, 1904)		8	L21		L21		L22
-- <i>zenelouae</i> Van Aartsen, 1988		3					L22
<i>Mangelia</i>							
-- <i>coarclata</i> (Forbes, 1840)		3					L28
-- <i>unifasciata</i> (Deshayes, 1835)		18		L7			L28
<i>Microdrillia</i>							
-- <i>loprestiana</i> (Calcara, 1841)		1		L7	L21		L28
<i>Haedropleura</i>							
-- <i>secalina</i> (Philippi, 1844)		6		L7	L2,L12		L28
<i>Crassopleura</i>							
-- <i>incrassata</i> (Dujardin, 1837)		13		L7	L2,L21		L28
<i>Mitrolumna</i>							
-- <i>olivioidea</i> (Cantraine, 1835)		8		L27	L21	L16	L28
<i>Raphitoma</i>							
-- cf. <i>purpurea</i> (Montagu, 1803)		1	L20		L21		L28
-- <i>echinata</i> Brocchi, 1814		4	L20		L21		L28
-- <i>erronea</i> (Monterosato, 1884)		1					
<i>Comarmondia</i>							
-- <i>gracilis</i> (Montagu, 1803)		8		L27	L21		L28
<i>Philbertia</i>							
-- <i>philberti</i> (Michaud, 1829)		8			L2,L21		L28
<i>Teretia</i>							
-- <i>anceps</i> (Elchwald, 1830)		1			L21		L17
HETEROBRANCHIA							
<i>Clathrella</i>							
-- <i>clathrata</i> (Philippi, 1844)		1					L28
<i>Eulimella</i>							
-- <i>scillae</i> (Scacchi, 1835)		1	L9	L27	L21		L17
<i>Odosornia</i>							
-- <i>conoidea</i> (Brocchi, 1814)		2	L9	L27	L2,L21		L17
<i>Ondina</i>							
-- <i>vitrea</i> (Brusina, 1866)		1					L28

	alive	dead	Rhodes previous	Crete	Aegean	Cyprus	Israel
OPISTHOBRANCHIA							
<i>Acteon</i>							
-- <i>tornatilis</i> (L., 1758)	1	1	L27	L21		L16	L17
<i>Crenilabium</i>							
-- <i>exile</i> (Jeffreys, 1870)		1	L21	L27	L21		L28
<i>Japonacteon</i>							
-- <i>pusillus</i> (McGillivray, 1843)		11		L27	L2		L17
<i>Retusa</i>							
-- <i>cuneata</i> (Tiberi, 1868)		1					
-- <i>mammillata</i> (Philippi, 1836)		1		L27	L21		L28
-- <i>truncatula</i> (Brugulère, 1792)		1	L21	L27	L2,L21	L16	L28
<i>Volvulella</i>							
-- <i>acuminata</i> (Brugulère, 1792)	1			L27	L2,L21		L28
<i>Ringicula</i>							
-- <i>auriculata</i> (Menard, 1811)		8		L27	L2,L21		L17
<i>Cylindrobulla</i>							
-- <i>fragilis</i> (Jeffreys, 1856)	9			L27	L21		
<i>Bulla</i>							
-- <i>striata</i> Brugulère, 1792		4		L27	L2,L21	L16	L17
<i>Hamlnoea</i>							
-- <i>hydatis</i> (L., 1758)	2	9	L12,L20	L27	L2,L21	L16	L17
-- <i>navicula</i> (Da Costa, 1778)		3			L21		
<i>Weinkauffia</i>							
-- <i>turgidula</i> (Forbes, 1844)	2	1		L27	L2,L21		L28
<i>Philine</i>							
-- <i>aperta</i> (L., 1767)	2				L2,L21	L16	L17
<i>Laona</i>							
-- <i>pruinosa</i> (Clark, 1827)		1					
<i>Cylichna</i>							
-- <i>cylindracea</i> (Pennant, 1777)		1	L21		L21		L28
<i>Roxania</i>							
-- <i>utriculus</i> (Brocchi, 1814)		7	L21	L27	L21		L28
<i>Umbraculum</i>							
-- <i>umbraculum</i> (Roeding, 1798)		1	L13,L20		L2,L21	L16	L17
<i>Pleurobranchaea</i>							
-- <i>meckelii</i> Meckel in Leue, 1813	9					L16	L17,L28
DIVASIBRANCHIA							
<i>Williamia</i>							
-- <i>gussonii</i> (O.G. Costa, 1829)		2	L21	L2,L21			L28
BIVALVIA							
PROTOBRANCHIA							
<i>Solemya</i>							
-- <i>logata</i> (Poli, 1795)	44	+	L21	L27	L2		L28
<i>Nucula</i>							
-- <i>hanleyi</i> Winckworth, 1931	1			L27	L26		
-- <i>nucleus</i> (L., 1758)	4			L27	L2	L16	L17
-- <i>sulcata</i> Bronn, 1831	8		L4	L27	L2		L17
-- <i>nitidosa</i> Winckworth, 1930	20			L7	L16		L28
<i>Nuculana</i>							
-- <i>commutata</i> (Philippi, 1844)	97	27	L4	L7	L2	L16	L28
-- <i>pella</i> (L., 1767)	79	13	L4	L7	L2	L16	L17,L28
PTERIDIOMORPHA							
<i>Arca</i>							
-- <i>noae</i> L., 1758		4	L4,12,20	L3	L2	L16	L17
-- <i>tetragona</i> Poli, 1795		5			L2		L28
<i>Anadara</i>							
-- <i>diluvii</i> (Lamarck, 1805)	1	5			L2	L16	L17
<i>Barbatia</i>							
-- <i>scabra</i> (Poli, 1795)	1	+		L11	L2		
<i>Bathyarca</i>							
-- <i>grenophia</i> (Risso, 1826)	13	4	L4	L7	L11		L17
<i>Glycymeris</i>							
-- <i>glycymeris</i> (L., 1758)	1	+	L4	L27	L1	L16	L28

	alive	dead	Rhodes previous	Crete	Aegean	Cyprus	Israel
<i>Modiolula</i>							
-- <i>phaseolina</i> (Philippi, 1844)	14	+	L4	L27	L26		L17
<i>Modiolus</i>							
-- <i>barbatus</i> (L., 1758)	1			L3	L2	L16	L17
<i>Modiolarca</i>							
-- <i>subpicta</i> (Cantraine, 1835)	1	1		L27	L2		L28
<i>Aequipecten</i>							
-- <i>opercularis</i> (L., 1758)	5	24	L4,L20	L3	L2	L16	L17
<i>Pseudamussium</i>							
-- <i>clavatum</i> (Poli, 1795)		9		L7	L1		L28
<i>Hyalopecten</i>							
-- <i>similis</i> (Laskey, 1811)	5	3	L4	L7	L2		L28
<i>Lissopecten</i>							
-- <i>hyalinus</i> (Poli, 1795)		2		L27	L2	L16	L28
<i>Palliolium</i>							
-- <i>incomparabile</i> (Risso, 1826)	4	3			L2		L28
<i>Chlamys</i>							
-- <i>flexuosa</i> (Poli, 1795)		20		L27	L2	L16	L17
<i>Limatula</i>							
-- <i>gwyni</i> (Sykes, 1903)		5	L4	L7	L2	L16	L17
-- <i>subauriculata</i> (Montagu, 1808)	2		L4,L21	L11	L2		L17
-- <i>subovata</i> (Jeffreys, 1876)	2			L27	L23		
<i>Limnea</i>							
-- <i>loscombi</i> (Sowerby, 1823)		15	L4		L2		L28
<i>Anomia</i>							
-- <i>ephippium</i> L., 1758	6	+	L4	L3	L2	L16	L17
HETERODONTA							
<i>Ctena</i>							
-- <i>decussata</i> (O.G. Costa, 1829)		+	L12,L20	L3	L1		L28
<i>Loripes</i>							
-- <i>lacteus</i> (L., 1758)	1		L12,15,20	L3	L1	L16	L17
<i>Megaxinus</i>							
-- <i>unguiculinus</i> Paliary, 1904	1			L29	L29	L29	
<i>Lucinella</i>							
-- <i>divaricata</i> (L., 1758)	4			L7	L2		L28
<i>Anodontia</i>							
-- <i>fragilis</i> (Philippi, 1836)	1	5	L5	L7	L12		L28
<i>Myrtea</i>							
-- <i>spinifera</i> (Montagu, 1803)	10	6		L14	L2	L16	L28
<i>Thyasira</i>							
-- <i>flexuosa</i> (Montagu, 1803)	9	1		L27	L2	L16	L17
-- <i>granulosa</i> (Monterosato, 1874)	1	9		L27			
<i>Diplodontia</i>							
-- <i>broccchi</i> (Deshayes, 1832)		3			L1		L28
<i>Hemilepton</i>							
-- <i>nitidum</i> (Turton, 1822)	1				L26		L28
<i>Montacuta</i>							
-- <i>substriata</i> (Montagu, 1808)	12				L26		
<i>Tellymya</i>							
-- <i>ferruginosa</i> (Montagu, 1808)	1			L27	L26		L28
-- <i>semirubra</i> (Gaglioli, 1992)		1					
<i>Mysella</i>							
-- <i>bidentata</i> (Montagu, 1803)	1			L7	L18		L28
-- <i>tumidula</i> (Jeffreys, 1866)	4						
<i>Glans</i>							
-- <i>trapezia</i> (L., 1767)		4	L12,L20	L3	L2	L16	
-- <i>aculeata</i> (Poli, 1795)	1	23	L5	L7	L5		L17
<i>Venericardia</i>							
-- <i>antiquata</i> (L., 1758)	1		L12	L3	L1	L16	L28
<i>Astarte</i>							
-- <i>sulcata</i> (Da Costa, 1778)		9	L5		L21		L17
<i>Gonilia</i>							
-- <i>calliglypta</i> (Dall, 1903)	4		L5	L27	L2		L28

	alive	dead	Rhodes previous	Crete	Aegean	Cyprus	Israel
<i>Cardium</i>							
-- <i>paucicostatum</i> Sowerby, 1841		9		L7	L21	L16	L17
<i>Parvicardium</i>							
-- <i>exiguum</i> (Gmelin, 1791)		2		L27	L2		L28
-- <i>minimum</i> (Philippi, 1836)		2	L5	L7	L2		L28
-- <i>scabrum</i> (Philippi, 1844)	29				L2		
<i>Plagiocardium</i>							
-- <i>papillosum</i> (Poll, 1795)	1	2	L5	L27	L2	L16	L17
<i>Abra</i>							
-- <i>alba</i> (W. Wood, 1802)	2	13	L5, L21	L7	L2		L17
-- <i>longicallus</i> (Scacchi, 1834)	9	12		L7	L5		
-- <i>nitida</i> (Müller, 1776)	17			L27	L26		L17
-- <i>prismatica</i> (Montagu, 1808)	3	4		L7	L2		L28
<i>Tellina</i>							
-- <i>balaustrina</i> (L., 1758)	3	2		L27	L2	L16	L28
-- <i>distorta</i> Poli, 1791	2	3			L2		L17
-- <i>donacina</i> L., 1758	3	1		L27	L1	L16	L28
-- <i>pulchella</i> Lamarck, 1818	3			L27	L2	L16	L28
-- <i>serrata</i> Brocchi, 1814	1	15	L5	L27	L2		L28
<i>Azorinus</i>							
-- <i>chamasolen</i> ((Da Costa, 1778)		19	L5		L2		L17
<i>Kelliella</i>							
-- <i>abyssicola</i> (Forbes, 1844)	3			L11	L2		
<i>Pitar</i>							
-- <i>rudis</i> (Poli, 1795)		8	L5	L3	L2		L17
<i>Tinnoclea</i>							
-- <i>ovata</i> (Pennant, 1777)	52		L5	L7	L2	L16	L17
<i>Gouldia</i>							
-- <i>minima</i> (Montagu, 1803)	6	2	L5	L3	L2	L16	L28
<i>Corbula</i>							
-- <i>gibba</i> (Olivé, 1792)	11	2	L5	L7	L2	L16	L17
<i>Sphenia</i>							
-- <i>binghami</i> Turton, 1822	1	+		L27	L23		L28
<i>Hiatella</i>							
-- <i>arctica</i> (L., 1767)	2			L27	L2		L17
ANOMALODESMATA							
<i>Poromya</i>							
-- <i>granulata</i> (Nyst & Westendorp, 1839)		6		L7	L2		L17
<i>Cardiomya</i>							
-- <i>costellata</i> (Deshayes, 1835)	12	16		L7	L2	L16	L17
<i>Cuspidaria</i>							
-- <i>cuspidata</i> (Olivé, 1792)	1	6		L7	L2	L16	L17
-- <i>rostrata</i> (Spengler, 1793)	3	5		L27	L2	L16	L17
<i>Lyonsia</i>							
-- <i>arenosa</i> (Müller, 1842)	1						
-- <i>norvegica</i> (Gmelin, 1791)	1			L27	L2		L28
<i>Pandora</i>							
-- <i>pinna</i> (Montagu, 1803)	8			L25	L2		L28
SCAPHOPODA							
<i>Fustiaria</i>							
-- <i>rubescens</i> (Deshayes, 1835)	2		L25	L12, L19		L16	L28
<i>Dentalium</i>							
-- <i>rossati</i> Caprotti, 1966	14	20	L25	L19			L17
CEPHALOPODA							
COLEOIDEA							
<i>Sepiola</i>							
-- <i>rondeletii</i> Leach, 1817	1					L16	L28

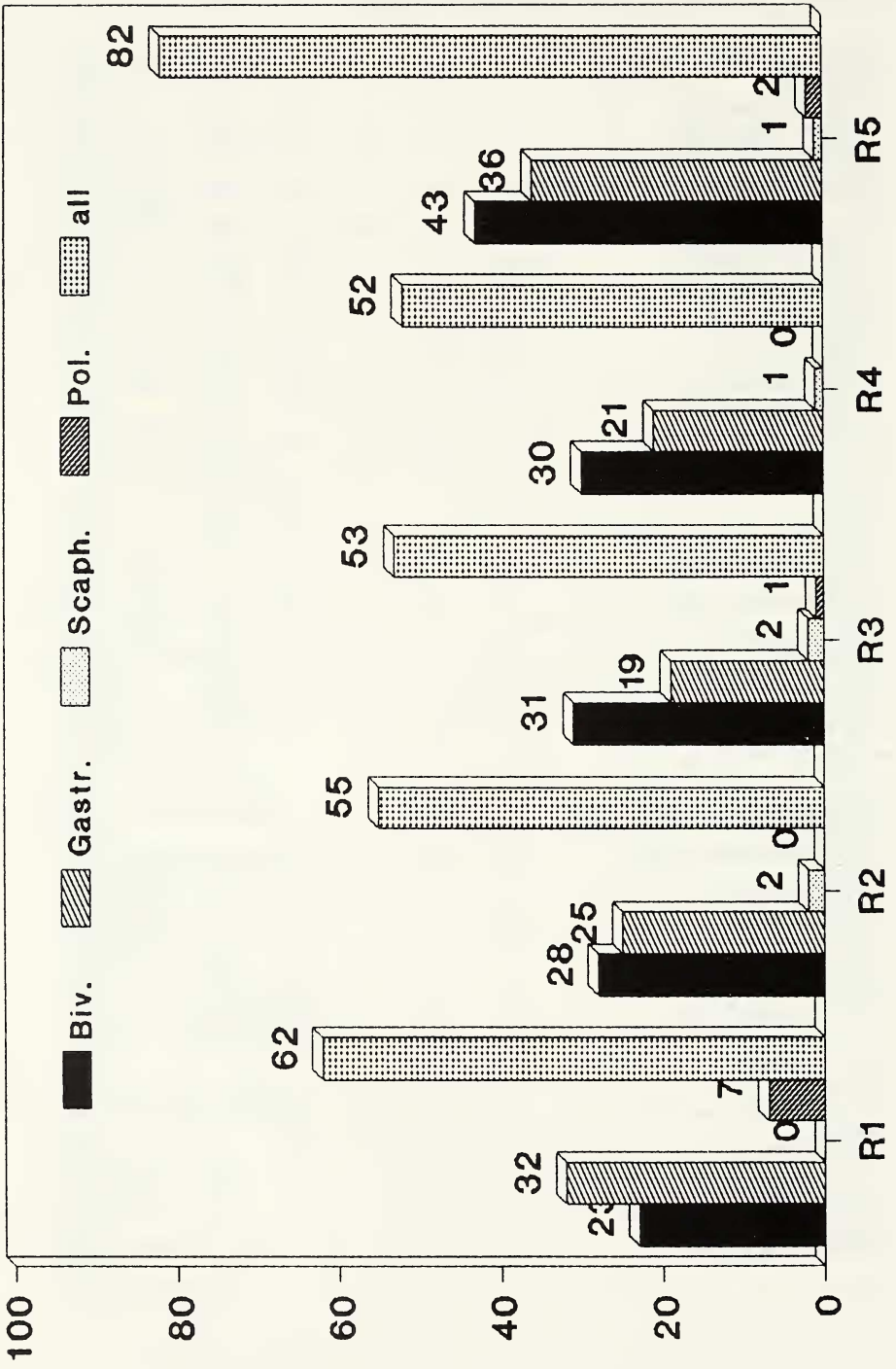
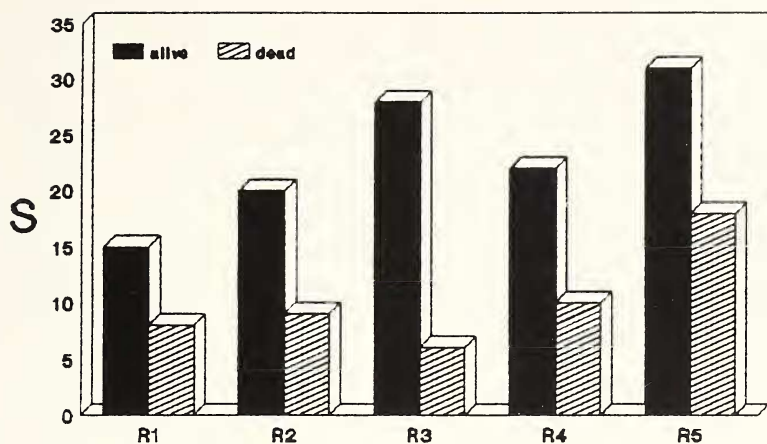


Fig. 2 - Distribution of the various molluscan classes at the sampling stations

Bivalvia



Gastropoda

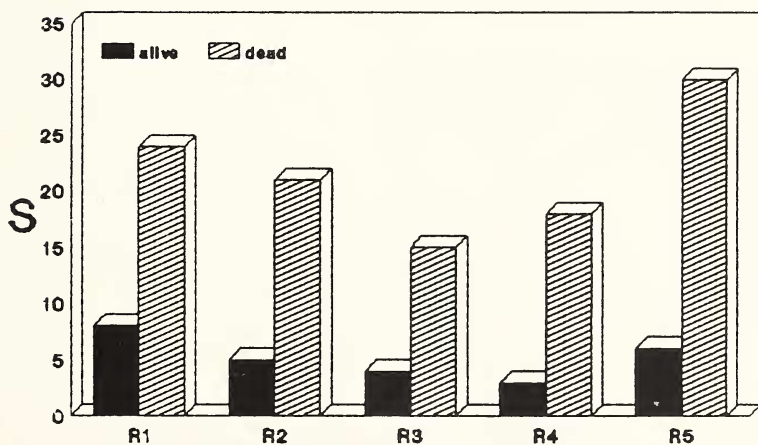


Fig. 3 - Difference in the distribution between the dead and alive specimens for the two major molluscan classes

Table 3 - Distribution of the main molluscan classes into the Rhodes stations as assigned from the living material (liv.) and shell debris (dead).

	R1		R2		R3		R4		R5	
	liv.	dead	liv.	dead	liv.	dead	liv.	dead	liv.	dead
	(Total)		(Total)		(Total)		(Total)		(Total)	
Bivalvia	15	8	20	9	28	6	22	10	31	18
	(23)		(28)		(31)		(30)		(43)	
Gasteropoda	8	24	5	21	4	15	3	18	6	30
	(32)		(25)		(19)		(21)		(36)	
Scaphopoda			2	1	2	1	1	1	—	1
	—		(2)		(2)		(1)		(1)	
Polyplacophora	7	—	—	—	1	—	—	—	2	—
	(7)		—		(1)		—		(2)	
Station Total	30	32	27	31	35	22	26	29	39	49
	(62)		(55)		(53)		(52)		(82)	

Nota: A lavoro già composto il Dr. J van Aartsen ci precisa quanto segue:

Venus ? miliaris was published by Philippi (Enumeratio Molluscorum Siciliae, vol. 2 : 36, pl 14, fig. 15) not later than febr. 1844.

The date of Forbes publication is not exactly known, but most probably later than febr. 1844. Therefore Philippi's name (*Kelliella miliaris*) should have priority on *Kelliella abyssicola* (Forbes, 1844).

REFERENCES

- AARTSEN J.J. VAN, 1988 - European Mollusca: Notes on less well known species. XII. *Bela menkehorsti* nom. nov. = *Pleurotoma nana* Scacchi, 1836 not Deshayes, 1835 and *Febria* (nov. gen.) *zenetouae* nov. spec. *La Conchiglia*, **232-233**: 30-31.
- AARTSEN J.J. VAN, A. BARASH & F. CARROZZA, 1989. Additions to the knowledge of the Mediterranean mollusca of Israel and Sinai. *Boll. Malacologico*, **25** (1-4): 63-76.
- AARTSEN J.J. VAN, F. CARROZZA, 1992. European marine mollusca: Notes on less well-known species. XIII *Megaxinus unguiculinus* Pallary, 1904. *La Conchiglia*, **263**: 18-20.
- BARASH A. & Z. DANIN, 1982. Mediterranean Mollusca of Israel and Sinai: Composition and distribution. *Israel J. Zool.*, **31**: 86-118.
- BARASH A. & Z. DANIN, 1986. Further additions to the knowledge of Indo-Pacific Mollusca in the Mediterranean Sea (Lessepsian migrants). *Spixiana*, **9** (2): 117-141.
- BARASH A. & Z. DANIN, 1988/89. Marine mollusca at Rhodes. *Israel J. Zool.*, **35**: 1-74.
- BARASH A. & Z. DANIN, 1992. Fauna Palestina. Mollusca I: Annotated list of Mediterranean molluscs of Israel and Sinai: 1-405. Jerusalem.
- BERDUGO V., 1968. Sur la presence dans la Mediterranee orientale de deux especes du genre *Calapia* (Copepoda, Calanoida). *Rapp. Comm. Int. Mer. Med.*, **19** (5): 445-446.
- BISACCHI I., 1928/29. Ricerche faunistiche nelle isole italiane dell'Egeo. Molluschi marini. *Arch. Zool. Ital.*, **12**: 369-378.
- BOGDANOS C., N. SIMBOURA & A. ZENETOS, in press. A benthic survey of the macrofauna in the Geras Gulf, Lesvos island, Greece. Accepted for publication in *Acta Adriatica*.
- CARROZZA F., 1985. Microdoridae di Malacologia mediterranea. Contributo sesto. *Boll. Malacologico*, **20** (9-12): 219-226.
- DEMETROPOULOS A., 1971. Marine molluscs of Cyprus. *Fish. Bull.*, **3**: 1-24.
- DESHAYES M., 1835. *Expedition Scientifique de Moree* (Section des Sciences Physiques, Mollusques), Tome III, Partie Zool., Paris.
- DIAPOLIS A. & C. BOGDANOS, 1983. Preliminary study of soft substrate macrozoobenthos and marine flora in the bay of Gera (Lesvos island, Greece). *Thalassographica*, **6**: 127-139.
- DI GERONIMO I. & R. PANETTA, 1973. La malacofauna batiale del golfo di Taranto. *Conchiglie*, **9** (5-6): 69-122.
- FISCHER P., 1877. Paleontologie des terraines tertiaires de l'Île de Rhodes. *Mem. Soc. Geol. France*, Ser. **3** (1): 1-58.
- FORBES E., 1844. Report on the Mollusca and Radiata of the Aegean Sea and on their distribution considered as bearing on Geology. *Report of the 13th meeting of the Brit. Ass. Advancement Sc.*, **13**: 130-193.
- FURNESTIN M.L., 1979. Aspects of the zoogeography of the Mediterranean plankton. In: *Zoogeography and diversity of plankton*. Ed. S. Van der Spoel & A.C. Pierrrot-Bults: 191-253.
- GAGLINI A., 1992. Terze spigolature... Monterosatiane. *Argonauta*, **7** (1-6): 125-180.
- ISSEL R., 1928/29. Cenni sui risultati ottenuti dalla Missione Zoologica nel Dodecaneso (1926) per quanto concerne la fauna e la flora marine, con alcune osservazioni generali. *Arch. Zool. Ital.*, **12-13**: 26-46.
- JEFFREYS J.G., 1879. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. II. *Proc. Zool. Soc. London*, **18**: 553-588.
- JEFFREYS J.G., 1881a. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. III. *Proc. Zool. Soc. London*: 693-724.
- JEFFREYS J.G., 1881b. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. IV. *Proc. Zool. Soc. London*: 922-952.
- JEFFREYS J.G., 1882. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. V. *Proc. Zool. Soc. London*: 656-687.
- JEFFREYS J.G., 1883a. Mediterranean Mollusca (No. 3) and other Invertebrata. *Ann. & Mag. N. Hist.*, Ser. **5**, **11**, No. 6: 393-??
- JEFFREYS J.G., 1883b. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. VI. *Proc. Zool. Soc. London*: 88-115.
- JEFFREYS J.G., 1884a. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. VII. *Proc. Zool. Soc. London*: 111-149.
- JEFFREYS J.G., 1884b. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. VIII. *Proc. Zool. Soc. London*: 341-372.
- JEFFREYS J.G., 1885. On the mollusca procured during the «Lightning» and «Porcupine» expeditions., 1868-70. Part. IX. *Proc. Zool. Soc. London*: 27-63.
- KARAKASSIS J., 1991. *Contribution to the study of the benthic ecosystem of the continental shelf of Crete*. Ph.D. thesis, University of Crete, 195 pp. (in greek).

- KOUKOURAS A. & T. KEVREKIDIS, 1986. Benthic fauna of the North Aegean Sea III. Dentallidae (Mollusca: Scaphopoda). *Oebalia*, **13**: 185-194.
- KOUTSOUBAS D., A. KOUKOURAS, I. KARAKASSIS & C. DOUNAS, 1992. Contribution to the knowledge of Gastropoda and Bivalvia (Mollusca) of Crete island (S. Aegean Sea). *Boll. Malacologico*, **28** (1-4): 69-82.
- NORDSIECK F., 1976. *Die europaischen Meeres-Gehaueschnecken (Prosobranchia)*. Gustav Fischer Verlag, Stuttgart, 539 pp.
- PAGET O.E., 1976. Die Molluskenfauna der Insel Rhodos. *Ann. Nat. Hist. Mus. Wien*, **8**: 681-78.
- PÉRÈS J.M. & P. PICARD, 1958. Marine Scientific Pages, Vol. B., Fasc. 4: 41-74 (in greek).
- POLLAK M.J., 1951. The sources of the deep water of the eastern Mediterranean Sea. *J. Mar. Res.*, **10**: 128-152.
- RAULIN V., 1870. Description physique de l'île de Crete. *Actes Soc. Linn. Bordeaux*, **24** (5-6): 353-770.
- SABELLI B., 1969. Alcune conchiglie di profondità del medio Adriatico. *Conchiglie*, **5** (7-8): 112-123.
- SCHWARTZ VON MOHRENSTERN G., 1864. Über die Familie der Rissoidea. II. Rissoa. *Denkschr. R. Akad. Wiss. Wien*, **23**: 1-56.
- STRACK H.L., 1990. The distribution of Chitons (Polyplacophora) in Greece: addendum. *Apex*, **5** (1-2): 13-15.
- STURANY R., 1896. Zoologische ergebnisse. VII. Mollusken. *Math. Natur. Clas.*, LXIII band: 1-38.
- TENEKIDIS N.S., 1989. *A collection of shells from the Greek Seas*. Protopapa Press, Athens, Greece, 188 pp. (in greek).
- TERRENI G., 1981. *Molluschi conchiferi del Mare antistante la costa Toscana*: 1-101, Livorno.
- TORTONESE E., 1951. I caratteri biologici del mediterraneo orientale e i problemi relativi. *At-tual. zool.*, **7**: 207-251.
- ZENETOS A., E. PAPATHANASSIOU & J.J. AARTSEN VAN, 1991. Analysis of benthic communities in the Cyclades Plateau (Aegean Sea) using ecological and paleoecological data sets. P.S.Z.N.I.: *Mar. Ecol.*, **12** (2): 123-137.